

## Performance Package Minnesota Profile of Learning

### 3501.0463 Preparatory Content Standards in Learning Area Four: Mathematical Applications

**Space, Shape, and Measurement: A student shall demonstrate understanding of basic concepts of coordinate systems, know precise mathematical names and properties of two- and three-dimensional shapes, convert common measurement units within the metric system and customary systems, and understand how properties of shapes affect stability and rigidity of objects.**

- Identifies the units used to measure speed.
- Identifies the units used to measure energy and power.
- Calculates angles in structural shapes.
- Identifies structural shapes.
- Identifies the importance of shape in structures.
- Relates structural shape and strength.
- States properties of structures.
- Recognizes geometric shapes in structures.
- Calculates angles in structures.
- Recognizes the principles of coordinate systems used in CAD.
- Creates a CAD drawing using coordinate systems.
- Investigates three-dimensional coordinate systems.
- Identifies how to draw a three-dimensional object by adding elevation.
- Identifies the properties of a polygon.
- Draws an orthographic projection of a 3D model.
- Uses CAD to create 3D models.
- Constructs CAD images using coordinate systems.

**Space, Shape, and Measurement: A student shall recognize and describe shape, size, and position of two- and three-dimensional objects and the images of the objects under transformations.**

- Receives and views satellite images.
- Examines infrared satellite images.
- Investigates three-dimensional coordinate systems.
- Identifies how to draw a three-dimensional object by adding elevation.
- Draws a three-dimensional mechanical component.
- Draws an orthographic projection of a 3D model.
- Uses CAD to create 3D models.
- Explores animation methods, including celluloid, 3D 'stop motion' and time lapse animation.
- Uses a multimedia Atlas to observe 3D topographic detail viewed from above.

**Space, Shape, and Measurement: A student shall create complex designs using transformations and tilings to generalize properties of shapes.**

- Calculates angles in structural shapes.
- Identifies structural shapes.
- Identifies the importance of shape in structures.
- Relates structural shape and strength.
- Recognizes geometric shapes in structures.
- Calculates facing area of shapes.
- Observes the effect of vehicle shape on airstreams.
- Calculates areas of simple shapes.

Creates animations to change the shape of objects using shape tweening.  
Describes the position of a shape in a diagram.  
Interprets the position of a shape in an animation from a piece of text.  
Identifies the use of compressing and stretching forces to shape materials.

**Space, Shape, and Measurement: A student shall connect geometric concepts and use them to test conjectures and solve problems, including distances (rational and irrational), the Pythagorean Theorem, similarity and congruence, slope, properties of polygons and polyhedra, and symmetry.**

Recognizes geometric shapes in structures.  
Identifies the properties of a polygon.  
Measures distance between lines to show that they are parallel.  
Estimates distance.  
Uses formulae to work out distance and speed.  
Calculates distance between features on a map using a scale.  
Measures distance using a map scale.

**Space, Shape, and Measurement: A student shall measure length, mass, perimeter, and area of quadrilaterals and circles, surface area and volume of solids and angles, including determining type of measurement (exact, approximate, derived), selecting appropriate measurement tools and units, and measuring to the appropriate accuracy.**

Finds area of highest temperature in an infrared image.  
Calculates the circumference of a circle.  
Calculates the averages of building heights and areas.  
Determines the size of the drawing area.  
Calculates the difference between the radii of two circles.  
Calculates the angle between posts arranged in a circle.  
Calculates the diameter of a circle.  
Calculates length of breath from respiratory rate.  
Calculates facing area of shapes.  
Measures chord length of wing section.  
Uses IT to examine the effect of thrust and mass on a rocket.  
Calculates the area of reception, for a walkie-talkie transmitter.  
Calculates areas of squares and rectangles used by printers.  
Calculates the volume of a robot workspace using fractions.  
Calculates the area of a factory floor.  
Calculates area and volume using units of measure.  
States the relationships between force, pressure and area.  
Calculates areas of simple shapes.  
Calculates the area of a piston in a hydraulic cylinder.  
Simulates custom and mass production systems.  
Calculates the length of time that an object breaks sensor beam 2 for.  
Interprets a diagram of a sliding door system to calculate extrusion lengths.  
States the number of degrees in a circle.  
Calculates the total length of time (in min. sec.) of a four scene video.  
Calculates the total length of time (in sec.) of a shoot.  
Identifies the length of a line from a scale.

**Space, Shape, and Measurement: A student shall describe how changes in the dimensions of figures affect perimeter, area, and volume.**

Finds area of highest temperature in an infrared image.

Identifies areas of weakness in structures.  
Identifies areas of weakness in a skyscraper.  
Calculates averages of building dimensions.  
Determines the dimensions and settings for the drawing area.  
Investigates three-dimensional coordinate systems.  
Calculates page dimensions.

**Number Sense: A student shall demonstrate understanding of number concepts including place value, exponents, prime and composite numbers, multiples, and factors; fractions, decimals, percents, integers, and numbers in scientific notation by translating among equivalent forms; and compare and order numbers within a set.**

Classifies substances in order of acidity.  
Calculates percentages.  
Calculates the power output of a 20% efficient system and identifies an application for the energy  
Translates weather data into a fraction.  
Calculates a value working with negative numbers.  
States the correct drawing number.  
Calculates the total of several whole numbers.  
Calculates total by addition of decimal numbers.  
Calculates percentage from a whole number ratio.  
Calculates output/input as a percentage.  
Solves math problems involving fractions.  
Calculates the percentage loss in body weight of an infant.  
Calculates quantity from percentages.  
Follows written instructions to correctly order a sequence of events.  
Measures lift readings to compare different wing types.  
Calculates the obstructed signal percentage for a microwave link.  
Calculates number of samples from time and sample frequency.  
Calculates the number of audio samples obtained in a given time period.  
Calculates the percentage of words not recognized by a voice recognition system.  
Calculates number of books on loan for a computerized library system.  
Express as a fraction the number of characters created in font set.  
Uses percentages to calculate the number of illuminated LEDs.  
Calculates the lifting capability of a robot for a given percentage increase of gripper strength.  
Calculates the volume of a robot workspace using fractions.  
Calculates number of divisions in a sheet of metal using fractions.  
Calculates the number of items on a production line using basic multiplication.  
Calculates the number of cars coming off a production line using basic addition.  
Indicates the number and position of layers contained in an animation.  
Calculates the number of frames when the number of frames is doubled.  
Calculates the total number of frames contained in 4 animations.  
Identifies that a mold can make multiple parts in one operation.  
Calculates the number of parts manufactured by a multi-part mold given the number of operations.  
Calculates the number of parts needed for a tabletop game.  
Adds and subtracts numbers using a calculator program.  
States the number of degrees in a circle.  
Rounds a number to the nearest 100.  
Uses standard notation to specify a scale.  
Determines the number of passenger vehicles for a school trip using division.

- Calculates the number of scenes shot from following two shooting plans.
- Counts the number of mid-shots used in a storyboard.
- Identifies how a 'clapper board' can be used to number the scenes during shooting.
- Calculates the number of scenes in a video.

**Number Sense: A student shall solve a variety of problems by representing numbers efficiently, selecting appropriate operations, selecting appropriate methods to estimate or compute, and generating and describing more than one method to solve problems.**

- Determines the most efficient number of blades for a wind-powered generator.
- Calculates the power output of a 20% efficient system and identifies an application for the energy
- Calculates efficiency as a percentage value.
- Identifies temperature estimate from a graph.
- Solves math problems in computer applications.
- Estimates distance.
- Estimates journey time between features on a map.
- Estimates the time gap in a video from a time line in video editing software.
- Estimates the time of a blank screen from a time line in video editing software.

**Number Sense: A student shall analyze and justify operations and methods used and evaluate the reasonableness of computed results to problems with proposed solutions.**

- States the reason for the difference in time taken for a timed run when the fan motor is reversed.
- Explains weaknesses in a problem solution.
- Compares results in a table and identifies the highest wind speeds.
- Analyzes data from a table.

**Number Sense: A student shall apply proportional reasoning to solve a variety of problems using rates, ratios, proportions, and percents.**

- Calculates percentages.
- Solves a problem involving ratios.
- Calculates percentage from a whole number ratio.
- Calculates output/input as a percentage.
- Solves a math problem involving ratios.
- States that current is proportional to resistance in a D.C circuit.
- Calculates the percentage loss in body weight of an infant.
- Measures temperature, pulse and respiration rates.
- Calculates quantity from percentages.
- Calculates length of breath from respiratory rate.
- Calculates the obstructed signal percentage for a microwave link.
- Calculates word recognition rate of a speech recognition system.
- Calculates the percentage of words not recognized by a voice recognition system.
- Calculates proportion of colored pixels in a computer bitmap image.
- Calculates computer screen refresh rates.
- Uses percentages to calculate the number of illuminated LEDs.
- Calculates the lifting capability of a robot for a given percentage increase of gripper strength.
- Performs gear ratio calculations.
- Calculates ratios in a belt driven system.
- Uses ratios to calculate mechanical advantage.
- Solves problems involving gear ratios.
- States the effect on a circuit of capacitor charge and discharge rates when connected to the base of
- Calculates using direct proportion when proportion is expressed in form "x to 1".

- Calculates using direct proportion expressed in form of "x to 2", "x to 3", etc.
- Calculates using direct proportion when proportion is expressed in form "x to 1".
- Calculates using direct proportion expressed in form of "x to 2", "x to 3", etc.
- Calculating percentage values of quantities.
- Calculates one number as a percentage of another.
- Calculates efficiency as a percentage value.
- Calculates percentage values of quantities.
- Calculates one number as a percentage of another.
- Calculates efficiency as a percentage value.
- Uses a formula relating to gear ratios.

**Number Sense: A student shall create a real-world communication that demonstrates the ability to use a variety of numbers in context.**

- Translates 'real world' information into working drawings.
- Calculates a value working with negative numbers.
- Calculates the total of several whole numbers.
- Calculates total by addition of decimal numbers.
- Calculates percentage from a whole number ratio.
- Calculates number of samples from time and sample frequency.
- Calculates the number of audio samples obtained in a given time period.
- Calculates the number of combination of access codes to open a virtual safe.
- Calculates number of books on loan for a computerized library system.
- Express as a fraction the number of characters created in font set.
- Uses percentages to calculate the number of illuminated LEDs.
- Calculates number of divisions in a sheet of metal using fractions.
- Calculates the number of items on a production line using basic multiplication.
- Calculates the number of cars coming off a production line using basic addition.
- Indicates the number and position of layers contained in an animation.
- Calculates the number of frames when the number of frames is doubled.
- Calculates the total number of frames contained in 4 animations.
- Calculates the number of parts manufactured by a multi-part mold given the number of operations.
- Calculates the number of parts needed for a tabletop game.
- Adds and subtracts numbers using a calculator program.
- States the number of degrees in a circle.
- States the number of degrees in a circle around the Earth.
- Rounds a number to the nearest 100.
- Determines the number of passenger vehicles for a school trip using division.
- Calculates the number of scenes shot from following two shooting plans.
- Calculates the number of mid-shots taken from a shooting script.
- Counts the number of mid-shots used in a storyboard.

**Chance and Data Handling: A student shall calculate basic measures of center and variability, to demonstrate understanding of basic concepts of probability and calculate simple probabilities.**

- Determines the center point of an object.
- Measures d.c. current in a circuit containing a variable resistor.
- Uses an oscilloscope to measure voltage across a variable power supply.
- Compares fixed and variable costs for manufacturing.
- Differentiates between fixed and variable costs for manufacturing.
- Uses formulae by substituting variables for symbols.

Draws a simple line graph from a table with two variables.

Draws a simple line graph from given variables.

**Chance and Data Handling: A student shall formulate a question and design an appropriate data investigation.**

Uses a remote control model car to investigate steering geometry.

**Chance and Data Handling: A student shall organize raw data and represent it in more than one way.**

Analyzes data from a table.

Extracts a temperature reading from a table of weather data.

Extracts data from an air to ground lightning strike map.

Translates weather data into a fraction.

Uses digital sensors to monitor conditions and provide data to control systems.

Plots weight and age data for infants on a growth chart.

Interprets data from growth charts.

Uses data to create a growth chart.

Interprets data from a Temperature, Pulse and Respiration chart.

Applies height formula to data from a model rocket launch.

Applies velocity formula to data from a model rocket launch.

Uses software to manipulate data relating to model rockets.

Extracts data from an instrument readout panel (Voltage measurements).

Extracts data from an instrument readout panel (Capacitor charge and discharge waveforms).

Extracts information from a database.

States how to use a database as an information store.

Interprets the data from a vehicle speed sensor.

Calculates the speed of a vehicle using data from sensors.

Reads information from data displays.

**Chance and Data Handling: A student shall analyze data by selecting and applying appropriate data measurement concepts.**

Identifies the units used to measure energy and power.

Measures d.c. voltage.

Measures d.c. current.

Measures resistance.

Measures resistor values, using a multimeter.

Measures quantities in a d.c. circuit, using a digital multimeter.

States the procedures used to measure quantities in a d.c. circuit, using a digital multimeter.

Measures the minimum force required to move a vehicle.

Works with units of measure of velocity.

Measures pulse and blood pressure.

Measures distance between lines to show that they are parallel.

Measures temperature, pulse and respiration rates.

Uses the wind tunnel to measure drag.

Measures the effect of vehicle design on drag.

States vertical angle measured using protractor and plumb line.

Measures chord length of wing section.

Measures lift force created by a flat wing section.

Measures lift readings to compare different wing types.

Measures the value of an angle using a protractor.

States the unit of measure for light.  
Calculates area and volume using units of measure.  
Measures force.  
Measures forces on an inclined plane.  
States the different connections required when using a multimeter to measure voltage and current.  
Uses a multimeter to measure voltage.  
Uses a multimeter to measure current.  
Uses an oscilloscope to measure voltage.  
Uses an oscilloscope to measure voltage across a variable power supply.  
Extracts data from an instrument readout panel (Voltage measurements).  
States how to use a multimeter to measure physical quantities in an electronic circuit.  
States how to use a computerized oscilloscope to measure physical quantities in an electronic  
Identifies the equator and prime meridian as the origins for latitude and longitude measurement.  
Measures distance using a map scale.

**Chance and Data Handling: A student shall critique various representations of data.**

Analyzes data to select the most appropriate technology for a given problem.  
Analyzes data from a table.  
Identifies methods for gathering weather data.  
Interprets technical data.  
Uses digital sensors to monitor conditions and provide data to control systems.  
Uses a digital impact sensor to monitor conditions and provide data to the user.  
Plots weight and age data for infants on a growth chart.  
Interprets data from growth charts.  
Uses data to create a growth chart.  
Interprets data from a Temperature, Pulse and Respiration chart.  
Applies height formula to data from a model rocket launch.  
Applies velocity formula to data from a model rocket launch.  
Uses software to manipulate data relating to model rockets.  
Extracts data from an instrument readout panel (Voltage measurements).  
Extracts data from an instrument readout panel (Capacitor charge and discharge waveforms).  
Extracts information from a database.  
States how to use a database as an information store.  
Uses distance and coordinate data to help plan routes.  
Interprets the data from a vehicle speed sensor.  
Interprets the data from a vehicle fuel level sensor.  
Calculates the speed of a vehicle using data from sensors.  
Calculates fuel quantities using data from sensors.  
Analyzes the performance of a road vehicle from test data.  
Reads information from data displays.

**Chance and Data Handling: A student shall devise and conduct a simulated probability situation.**

Uses car performance simulation software to design a streamlined car.  
Applies formula for calculating velocity to a simulated space mission.  
Designs a hydraulic circuit to simulate a sequencing application.  
Uses computer simulation to obtain Brinell hardness figures of metals and plastics.  
Follows instructions to run a simulated hardness test on a computer.  
Follows written instructions to run a simulated melting point test on a computer.  
Uses computer simulation to compare the density of metals and plastics.

**Chance and Data Handling: A student shall predict future results based on experimental results.**

- Compares results in a table and identifies the highest wind speeds.
- Defines and predicts the performance of a maglev vehicle when magnetic forces are increased.
- Uses IT to make predictions about model rockets.
- Predicts robot movement from a program sequence.
- Predicts four figure grid references from known coordinates.
- Predicts latitude and longitude relative to known locations.
- Compares predicted with actual latitude and longitude GPS readings.

**Patterns and Functions: A student shall analyze patterns and use concepts of algebra to represent mathematical relationships, including demonstrating understanding of the concepts of variables, expressions, and equations.**

- Works with algebra to convert watts into kilowatts.
- Quotes the algebraic formula for calculating stress.
- Calculates an unknown from an algebraic expression.
- Measures d.c. current in a circuit containing a variable resistor.
- Solves math problems using substitution into Ohm's Law expression.
- States the relationship between velocity, speed, acceleration and deceleration.
- Investigates the relationship between force and motion.
- Identifies characteristics of a digital speech wave pattern.
- Calculates robot position coordinates using algebra.
- States the relationships between force, pressure and area.
- States the relationship between current and voltage.
- States the relationship between voltage and resistance.
- Recognizes the relationship between current and resistance and current and voltage.
- Compares fixed and variable costs for manufacturing.
- Identifies the relationship between compass points.
- Uses formulae by substituting variables for symbols.
- Draws a simple line graph from a table with two variables.
- Identifies radius and diameter and their relationship.

**Patterns and Functions: A student shall recognize, analyze, and generalize patterns found in linear and nonlinear phenomena; data from lists, graphs, and tables; number theory; sequences; rational numbers; and formulas.**

- Follows written instructions to correctly order a sequence of events.
- Follows a sequence of events when programming a set of traffic lights.
- Follows a program sequence to control a robot.
- Interprets information from robot sequence diagrams.
- Investigates the use of timers and timed sequences in ladder logic programs.
- Interprets a sequence of instructions.
- Calculates speed using the formula  $d \div t$ .
- Applies height formula to data from a model rocket launch.
- Applies velocity formula to data from a model rocket launch.
- Applies formula for calculating velocity to a simulated space mission.
- Practices application of formula for calculating height.
- Practices application of formula for calculating velocity.
- Uses formula to calculate mechanical advantage.
- Uses formulae to work out distance and speed.
- Uses formulae to calculate speed.

**Patterns and Functions: A student shall represent and interpret cause and effect relationships using algebraic expressions, equations and inequalities, tables and graphs, verbal descriptions, and spread sheets.**

- Works with algebra to convert watts into kilowatts.
- Quotes the algebraic formula for calculating stress.
- Calculates an unknown from an algebraic expression.
- Demonstrates the effect of changing the angle of attack on lift.
- Observes the effect of changing wind speed on lift.
- Measures the effect of increasing the angle of attack.
- Calculates the effect of adjusting the lift/drag range on meter readings.

**Patterns and Functions: A student shall connect verbal, symbolic, and graphical representations; identify constraints; translate algebraic expressions into equivalent forms; and propose and justify solutions in problem situations.**

- Uses input devices to alter information in a graphics file.
- Creates an advertising flyer using a word processor, incorporating text and graphics.
- Identifies the process used by printers to create text and graphics.
- Identifies pneumatic components and their function from symbols.
- Uses symbols to draw a pneumatic circuit diagram.
- Identifies the function of pneumatic symbols from text.
- Recognizes flow paths from pneumatic symbols.
- Identifies pneumatic valves from their graphic symbols.
- Evaluates proposed solutions to a pneumatic problem.
- Identifies hydraulic components from symbols.
- Recognizes component function from symbols.
- Uses diagrams to identify logic gate symbols.
- Identifies the name of a graphic symbol contained in an animation library.
- Recognizes the correct symbols and conventions when designing electronic systems.
- Identifies equivalent fractions shown pictorially.
- Raises fractions to equivalent terms.
- Identifies fractional equivalents of 25%, 50% and 75%.
- Identifies fractional equivalents of 10%, 20% 30%, etc.
- Uses formulae by substituting variables for symbols.

**Patterns and Functions: A student shall use properties of mathematics to informally justify reasoning in a logical argument.**

- Solves math problems.
- Solves math problems.
- Solves math problems using substitution into Ohm's Law expression.
- Solves a math problem involving ratios.
- Solves math problems involving fractions.
- Solves math problems in Basic Electricity.
- Solves math problems relating to health management.
- Solves math problems for space technology.
- Applies module math to determine remainders for a programming exercise.
- Solves math problems in computer applications.
- Solves math problems in computer aided publishing.
- Solves math problems in Robotics and Automation.
- Solves math problems for mechanical systems.

- Solves math problems for pneumatic applications.
- Solves math problems for hydraulic systems.
- Solves math problems for electronic systems.
- Solves math problems.
- Uses a calculator program to solve mathematical problems.

### **3501.0464 Preparatory Content Standards In Area Five: Inquiry**

**Direct Observation: A student shall demonstrate the ability to gather information to answer a scientific or social science question through: direct observations, including framing a question, collecting and recording data, displaying data in appropriate format, looking for patterns in observable data, relating findings to new situations or large group findings, answering a question or presenting a position using data, and identifying areas for further investigation.**

- Maintains and organizes a record of work.
- Uses a computer to detect and display localized weather data.
- States the maximum recorded value from a graph.
- States how to record vital signs.
- Observes airstreams in the wind tunnel.
- Observes the effect of adjusting instrument controls.
- Observes turbulent airstreams in the wind tunnel.
- Observes the effect of vehicle shape on airstreams.
- Observes airstreams around different wing designs.
- Observes the effect of changing wind speed on lift.
- Identifies characteristics of a digital speech wave pattern.
- Recognizes components of speech patterns.
- Distinguishes between different recording formats.
- Selects information in text, audio and visual formats.
- Outlines variety in display techniques.
- Interprets experimental observations.
- Observes the use of the infrared sensor in a Work-Cell.
- Extracts information on the format of saving an Industrial Control program.
- Enter and formats text in a diary slide.
- Observes that thermoplastics become workable above a given temperature.
- Observes the effect of not clamping a mold during the plastic injection process.
- Describes the process of formatting a text document.
- Uses a multimedia Atlas to observe 3D topographic detail viewed from above.
- Observes stored photographic images on a digital camera.
- Observes when a filter is required.
- Uses a multimeter to investigate the lighting system of a vehicle.
- Uses a remote control model car to investigate the function of a motor vehicle suspension system.
- Uses a remote control model car to investigate the friction and traction.

**Direct Observation: A student shall demonstrate the ability to gather information to answer a scientific or social science question through direct observations, interviews, or surveys, including framing a question; collecting data through observation, interviews, or surveys; recording and organizing information; and evaluating the question based on findings.**

- States scientific principles of importance to space technology.
- Performs calculations to evaluate communication systems.
- Performs force-pressure-area evaluation on cylinder applications.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by generating a question to be answered or a position to be supported through investigation.**

- Investigates the greenhouse effect using experimental models.
- Investigates the components and links in the water cycle.
- Investigates the meteorological field precipitation.
- Investigates the impact of technology on medical treatments.
- Investigates the causes of daily stress.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by using electronic media or other available means to access relevant information.**

- Explores the use of an internet based project.
- Extracts digital camera details from a simulated internet site.
- Produces a picture for an internet web page.
- Identifies relevant criteria to create an itinerary for a business trip.
- Classifies maps relevant to purpose.
- Extracts relevant information from tables.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by determining how to record and organize information.**

- Maintains and organizes a record of work.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by gathering information from multiple sources.**

- Identifies methods for gathering weather data.
- Outlines how satellite technology is used to gather weather data.
- Obtains technical information about wave files from various sources.
- Calculates the number of audio samples obtained in a given time period.
- Uses computer simulation to obtain Brinell hardness figures of metals and plastics.
- Recognizes the conditions necessary to obtain a GPS reading.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by evaluating the relevance of the information.**

- Identifies relevant criteria to create an itinerary for a business trip.
- Classifies maps relevant to purpose.
- Extracts relevant information from tables.

**Accessing Information: A student shall access information and use a variety of sources to answer a question or support a position by answering the question or supporting a position by synthesizing information.**

- Describes support processes related to space technology.
- Identifies uses for digital speech synthesis.
- Identifies tools involved in digital speech synthesis.

### **3501.0465 Preparatory Content Standards In Learning Area Six: Applied Scientific Methods**

**Living Systems: A student shall demonstrate knowledge of interactions and interdependence of living systems by understanding the human body, including heredity, reproduction, and regulation and behavior; plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems; and the dynamic effect of humans interacting with the environment by formulating questions to be answered based on systematic observation.**

- Uses human body software to identify and locate body parts.
- Identifies the name and function of the different regions of the human brain.
- Assembles a model of a human body.
- Describes the structure of a human cell.
- Identifies parts of the human anatomy that allow us to speak and hear.
- Identifies the input-process-output elements of human control systems.

**Living Systems: A student shall demonstrate knowledge of interactions and interdependence of living systems by understanding the human body, including heredity, reproduction, and regulation and behavior; plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems; and the dynamic effect of humans interacting with the environment by designing and conducting investigations and field studies.**

- Indicates that the use of fossil fuels harms the environment.
- Investigates the meteorological field precipitation.
- Identifies characteristics of the environment.
- Recognizes how environmental obstructions can block microwave signals.
- Investigates the greenhouse effect using experimental models.
- Investigates the components and links in the water cycle.
- Investigates the impact of technology on medical treatments.
- Investigates the requirements for a balanced diet.
- Investigates the causes of daily stress.
- Investigates types of fitness programs.
- Investigates the impact of orthotics and prosthetics on society.

**Living Systems: A student shall demonstrate knowledge of interactions and interdependence of living systems by understanding the human body, including heredity, reproduction, and regulation and behavior; plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems; and the dynamic effect of humans interacting with the environment by analyzing data to support or refute hypotheses by identifying patterns in data; and comparing results to known scientific theories, current models, or personal experience; and considering multiple interpretations of data.**

- Recognizes the importance of maintaining personal health.
- Identifies from a design brief which parts of a personal profile need to be animated.
- Identifies experiences required for a digital photography based career.

**Living Systems: A student shall demonstrate knowledge of interactions and interdependence of living systems by understanding the human body, including heredity, reproduction, and regulation and behavior; plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems; and the dynamic effect of humans interacting with the environment by describing how a premise is supported by scientific concepts, principles, theories, or laws.**

- States scientific principles of importance to space technology.
- Recognizes the concepts of Systems and control.
- Investigates the concept of line of sight.
- Investigates the concept of pressure.

Identifies the concept of mechanization.

**Living Systems: A student shall demonstrate knowledge of interactions and interdependence of living systems by understanding the human body, including heredity, reproduction, and regulation and behavior; plants, animals, and microorganisms including diversity and adaptation of organisms, and populations and ecosystems; and the dynamic effect of humans interacting with the environment by creating a model to illustrate a contemporary or historical concept, principle, theory, or law.**

Creates tables, graphs and flowcharts when conducting research.

Designs and creates a poster to inform the public the dangers of smoking tobacco.

Uses data to create a growth chart.

Creates an advertising flyer using a word processor, incorporating text and graphics.

**Earth Systems: A student shall demonstrate understanding of the structure of earth systems, including the geosphere, hydrosphere, and atmosphere; concepts of change and constancy in the earth's history and theories of origin through evidence found in fossils, rocks and layers, land forms, and natural events; and the relative position and motion of objects in the solar system including moon phases and tides, seasons, eclipses, gravitational force, and planetary motion by formulating questions to be answered based on systematic observation.**

Indicates that the use of fossil fuels harms the environment.

Builds and tests a model car powered by solar energy.

Identifies two transducers used in the solar powered car.

Uses an IT package to research the application and operation of a hydroelectric power plant.

State the purpose of the sub-systems within a hydroelectric power plant.

Identifies the natural source of energy.

Identifies criteria which will reduce the efficiency of a solar panel.

States the function of a solar panel transducer.

States how energy is transferred in a hydroelectric power plant.

Defines characteristics of the atmosphere.

Tracks polar and geostationary satellites.

States the different modes of land transportation.

States the effect of earthquakes on skyscrapers.

States the number of degrees in a circle around the Earth.

**Earth Systems: A student shall demonstrate understanding of the structure of earth systems, including the geosphere, hydrosphere, and atmosphere; concepts of change and constancy in the earth's history and theories of origin through evidence found in fossils, rocks and layers, land forms, and natural events; and the relative position and motion of objects in the solar system including moon phases and tides, seasons, eclipses, gravitational force, and planetary motion by designing and conducting investigations and field studies.**

Investigates the effect of gravity on mechanical devices.

Examines the influence of gravity on people.

Interprets text describing the effects of gravity, stretch and squash in animation.

Uses a remote control model car to investigate steering geometry.

**Earth Systems: A student shall demonstrate understanding of the structure of earth systems, including the geosphere, hydrosphere, and atmosphere; concepts of change and constancy in the earth's history and theories of origin through evidence found in fossils, rocks and layers, land forms, and natural events; and the relative position and motion of objects in the solar system including moon phases and tides, seasons, eclipses, gravitational force, and planetary motion by analyzing data to support or refute hypotheses by identifying patterns in data; and comparing results to known scientific theories, current models, or personal experience; and considering multiple interpretations of data.**

Uses an IT package to research the application and operation of a hydroelectric power plant.

- Defines characteristics of the atmosphere.
- Tracks polar and geostationary satellites.
- Recognizes geometric shapes in structures.
- Examines the influence of gravity on people.

**Earth Systems: A student shall demonstrate understanding of the structure of earth systems, including the geosphere, hydrosphere, and atmosphere; concepts of change and constancy in the earth's history and theories of origin through evidence found in fossils, rocks and layers, land forms, and natural events; and the relative position and motion of objects in the solar system including moon phases and tides, seasons, eclipses, gravitational force, and planetary motion by describing how a premise is supported by scientific concepts, principles, theories, or laws.**

- Indicates that the use of fossil fuels harms the environment.
- Identifies two transducers used in the solar powered car.
- Identifies the natural source of energy.
- Identifies criteria which will reduce the efficiency of a solar panel.
- Defines characteristics of the atmosphere.
- Identifies the effect of earthquakes on skyscrapers.
- Recognizes geometric shapes in structures.
- Follows written instructions to correctly order a sequence of events.
- Performs experiments to demonstrate the effects of gravity.
- Follows a sequence of events when programming a set of traffic lights.
- Interprets text describing the effects of gravity, stretch and squash in animation.

**Earth Systems: A student shall demonstrate understanding of the structure of earth systems, including the geosphere, hydrosphere, and atmosphere; concepts of change and constancy in the earth's history and theories of origin through evidence found in fossils, rocks and layers, land forms, and natural events; and the relative position and motion of objects in the solar system including moon phases and tides, seasons, eclipses, gravitational force, and planetary motion by creating a model to illustrate a contemporary or historical concept, principle, theory, or law.**

- Builds and tests a model car powered by solar energy.
- Identifies two transducers used in the solar powered car.
- Follows written instructions to correctly order a sequence of events.
- Performs experiments to demonstrate the effects of gravity.
- Follows a sequence of events when programming a set of traffic lights.
- Uses a remote control model car to investigate steering geometry.

**Physical Systems: A student shall demonstrate an understanding of the fundamental laws and concepts of the physical world including properties of matter, physical and chemical changes, transfer of energy, and force and motion by formulating questions to be answered based on systematic observation.**

- Defines alternative energy.
- States that energy can be transformed.
- States that a device which changes energy from one form to another is called a transducer.
- States that wind energy can be used to generate electricity.
- States an application of electrical energy.
- States that kinetic energy is energy an object has because it is moving.
- States the energy conversion taking place in a wind turbine.
- States how energy is transferred in a hydroelectric power plant.
- States dangers of nuclear energy.
- Writes a report on Alternative Energy.
- Makes a presentation to a group on Alternative Energy.

- States the energy groups.
- Recognizes the difference between potential and kinetic energy.
- States the main sources of energy used in transportation systems.
- States the general uses of energy in society.
- States the forms and types of energy.
- Recognizes the sources of energy used in transportation systems.
- Describes methods of transferring energy using mechanical systems.

**Physical Systems: A student shall demonstrate an understanding of the fundamental laws and concepts of the physical world including properties of matter, physical and chemical changes, transfer of energy, and force and motion by designing and conducting investigations and field studies.**

- Builds and tests a model car powered by solar energy.
- Identifies the device used to convert wind energy to electrical energy.
- Examines how energy is produced by a nuclear power plant.
- Investigates motion and energy transformations in pneumatics.
- Evaluates compressed air as a medium for transferring energy in fluid power systems.

**Physical Systems: A student shall demonstrate an understanding of the fundamental laws and concepts of the physical world including properties of matter, physical and chemical changes, transfer of energy, and force and motion by analyzing data to support or refute hypotheses by identifying patterns in data; and comparing results to known scientific theories, current models, or personal experience; and considering multiple interpretations of data.**

- Defines alternative energy.
- Identifies the device used to convert wind energy to electrical energy.
- Identifies the processes involved when using nuclear energy to generate electricity.
- Identifies the possible dangers of using nuclear energy.
- Identifies the need to preserve existing energy resources and to find new methods of providing
- Identify some of the ways in which alternative energy sources are being used globally.
- Identifies jobs provided by the alternative energy industries.
- Identifies the natural source of energy.
- Identifies a source of Kinetic energy.
- Identifies an application of wind energy.
- Identifies a non-renewable energy resource.
- Identifies a modern application of an alternative energy source.
- Examines how energy is produced by a nuclear power plant.
- Identifies the units used to measure energy and power.
- Identifies how a model rocket uses and transfers stored energy.
- Identifies the correct energy flow in a nuclear power plant.
- Identifies the problems associated with non-renewable energy resources.
- Writes a report on Alternative Energy.
- States the energy groups.
- Recognizes the difference between potential and kinetic energy.
- Gives direct instructions to control movement to identify potential and kinetic energy.
- Recognizes the sources of energy used in transportation systems.
- Describes methods of transferring energy using mechanical systems.
- Investigates motion and energy transformations in pneumatics.
- Evaluates compressed air as a medium for transferring energy in fluid power systems.

**Physical Systems: A student shall demonstrate an understanding of the fundamental laws and concepts of the physical world including properties of matter, physical and chemical changes, transfer of energy, and force and motion by describing how a premise is supported by scientific concepts, principles, theories, or laws.**

- Identifies the device used to convert wind energy to electrical energy.
- States that a device which changes energy from one form to another is called a transducer.
- Identifies the processes involved when using nuclear energy to generate electricity.
- Identifies the need to preserve existing energy resources and to find new methods of providing
- Identify some of the ways in which alternative energy sources are being used globally.
- Identifies jobs provided by the alternative energy industries.
- Identifies the natural source of energy.
- Identifies a source of Kinetic energy.
- Identifies an application of wind energy.
- Identifies a non-renewable energy resource.
- Identifies a modern application of an alternative energy source.
- Calculates the power output of a 20% efficient system and identifies an application for the energy
- Identifies the units used to measure energy and power.
- Identifies the correct energy flow in a nuclear power plant.
- Identifies the problems associated with non-renewable energy resources.
- Writes a report on Alternative Energy.
- Recognizes the difference between potential and kinetic energy.
- Gives direct instructions to control movement to identify potential and kinetic energy.
- Recognizes the sources of energy used in transportation systems.
- Describes methods of transferring energy using mechanical systems.
- Investigates motion and energy transformations in pneumatics.
- Evaluates compressed air as a medium for transferring energy in fluid power systems.

**Physical Systems: A student shall demonstrate an understanding of the fundamental laws and concepts of the physical world including properties of matter, physical and chemical changes, transfer of energy, and force and motion by creating a model to illustrate a contemporary or historical concept, principle, theory, or law.**

- Builds and tests a model car powered by solar energy.
- Identifies the device used to convert wind energy to electrical energy.
- Builds a motor support structure and uses an appropriate alternative energy source to drive it.